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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,417	03/30/2004	Hongyu Yue	071469-0307692	1294
909	7590	01/10/2006	EXAMINER	
PILLSBURY WINTHROP SHAW PITTMAN, LLP			CHEN, KIN CHAN	
P.O. BOX 10500			ART UNIT	
MCLEAN, VA 22102			PAPER NUMBER	
			1765	
DATE MAILED: 01/10/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/817,417

Applicant(s)

YUE ET AL.

Examiner

Kin-Chan Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) 10 and 11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 033004:070704.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-9, drawn to a method, classified in class 438, subclass 706.
 - II. Claims 10 and 11, drawn to an apparatus, classified in class 156, subclass 345.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another and materially different process such as plasma deposition or vapor deposition process.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Jeffery Karceski on December 16, 2005 a provisional election was made with traverse to prosecute the invention of group I, claims 1-9. Affirmation of this election must be made by applicant in replying to this Office

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action. Claims 10 and 11 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Specification

3. Updating the status of related U.S. Applications on page 1 of the specification is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 102

5. Claims 1-6 are rejected under 35 U.S.C. 102(e) as being anticipated by Tomoyasu et al. (US 2004/0185583).

In a method for removing chemical oxide on a substrate, Tomoyasu teaches that trim amount data as a function of time for a process recipe may be acquired. A

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relationship between a value related to the trim amount data and time may be determined. The target trim amount and the relationship may be used to determine a target trim time for achieving the target trim amount. The feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating. Tomoyasu teaches varying flow rates of HF, NH₃, and argon. Tomoyasu also teaches varying pressure, and temperature. Tomoyasu teaches treating a silicon oxide feature. See abstract; [0007], [0059]-[0064], [0074], [0200].

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu et al. (US 2004/0185583).

In a method for removing chemical oxide on a substrate, Tomoyasu teaches that trim amount data as a function of time for a process recipe may be acquired. A relationship between a value related to the trim amount data and time may be determined. The target trim amount and the relationship may be used to determine a

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target trim time for achieving the target trim amount. The feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating. Tomoyasu teaches varying flow rates of HF, NH₃, and argon. Tomoyasu also teaches varying pressure, and temperature. Tomoyasu teaches treating a silicon oxide feature. See abstract; [0007], [0059]-[0064], [0074], [0200].

Tomoyasu teaches trim amount data as a function of time. Tomoyasu teaches SPC charts, and various statistics models and tools may be used, see [0074]. Hence, after completing data collection, it would have been obvious to one with ordinary skill in the art to apply commonly used curve fitting techniques and statistical tools (such as log relationship or exponential relationship as instantly claimed) to determine the relationship between trim time and trim amount.

8. Claims 1 and 4-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle et al. (US 2004/0097047).

In a method for removing chemical oxide on a substrate, Natzle teaches that a chemical oxide removal process may be performed using a process recipe including a first reactant and a second reactant. Natzle [0042] teaches acquiring trim amount data as a function of variable parameters (such as, time, temperature, composition, residence time, pressure of the reactant, the amount of reactant or the rate of reactant), **all of which can be regulated**. Natzle [0042] also discloses that the aforementioned

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variable parameters influence the amount removed. Therefore, it would have been obvious to one with ordinary skill in the art that trim amount data as a function of time for a process recipe may be acquired. A relationship between a value related to the trim amount data and time may be determined. The target trim amount and the relationship may be used to determine a target trim time for achieving the target trim amount. Natzle teaches that the feature on the substrate may be chemically treated using the process recipe for the target trim time. The target trim amount may be substantially removed from the feature. Natzle teaches varying flow rates of HF, NH₃, pressure, and temperature. See [0014] [0037] [0038] [0042]-[0044].

As to dependent claim 6, Natzle teaches treating a silicon oxide feature, see [0014].

As to claims 7 –9, after gathering information of etching rates, thickness (trim amount) as function of time, process parameters), it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common statistical methods (such as regression, extrapolation, best-fit, the harmonic of signal using multivariate analysis, polynomial, least squares, interpolation), therefore, making the data analysis in the instant claims obvious.

Claim 5 differs from Natzle by specifying well-known features (such as adding inert gas argon to the etchant as a process gas and determining the effect on the etching) to the art of semiconductor device fabrication, the examiner takes official notice. It is the examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to incorporate inert gas to

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same in order to provide their art recognized advantages and produce an expected result with a reasonable expectation of success.

9. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle as applied to claim 1 above, and further in view of Doris et al. (US 2004/0241981; hereinafter "Doris").

The discussion of modified Natzle from above is repeated here.

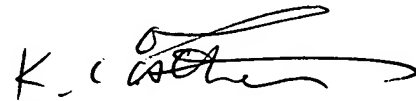
Natzle is silent about the heating and rinsing with water after the chemical treating. In a method for chemical oxide removing, Doris teaches heating and rinsing with water after the chemical treating so as to efficiently remove the solid reaction product, see [0046]. Hence, it would have been obvious to one with ordinary skill in the art to modify Natzle by heating and rinsing with water as taught by Doris in order to efficiently remove the solid reaction product.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status

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information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

January 5, 2006

A handwritten signature in black ink, appearing to read 'K. Chen', with a long horizontal flourish extending to the right.

Kin-Chan Chen
Primary Examiner
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